

GUJARAT TECHNOLOGICAL UNIVERSITY

BE-5 SEMESTER – OLD PAPER – S22 TO S25 – QUESTION BANK

Subject Name & Code:

Electrical Machine- II- 3150910

Chapter 1: Induction Machines

Repeated Questions:

1. **Draw and explain the torque-slip characteristics of a 3-phase induction motor.**
 - **Appeared in:** SUM 2022 (Q1c-07), WIN 2023 (Q2b-04), SUM 2023 (Q1b-04), WIN 2024 (Q2c-07)
 - **Marks Weightage:** High (04 to 07 marks)
2. **Explain various methods of starting a 3-phase induction motor. / Explain the Star-Delta starter.**
 - **Appeared in:** SUM 2022 (Q3c-07), SUM 2023 (Q3b-04), WIN 2022 (Q2c-07), SUM 2024 (Q1b-04), SUM 2025 (Q3c-07)
 - **Marks Weightage:** High (04 to 07 marks)
3. **Explain the No-Load and Blocked Rotor tests on a 3-phase induction motor. (Purpose, procedure, circuit diagram)**
 - **Appeared in:** SUM 2023 (Q3c-07), WIN 2022 (Q3c-07), WIN 2023 (Q3b-04), SUM 2025 (Q3c-07), WIN 2024 (Q3b-04)
 - **Marks Weightage:** High (07 marks)
4. **Compare Squirrel Cage and Slip-Ring (Wound Rotor) Induction Motors.**
 - **Appeared in:** SUM 2023 (Q2a-03), WIN 2022 (Q1c-07), SUM 2024 (Q2b-04), SUM 2025 (Q3b-04)
 - **Marks Weightage:** Medium to High (03 to 07 marks)
5. **Derive the torque equation for an induction motor (starting/running/maximum torque conditions).**
 - **Appeared in:** WIN 2023 (Q1c-07), SUM 2024 (Q2c-07)
 - **Marks Weightage:** High (07 marks)
6. **Explain the production of a Rotating Magnetic Field (RMF) in a 3-phase induction motor.**
 - **Appeared in:** SUM 2022 (Q1c-07), SUM 2024 (Q1c-07), WIN 2024 (Q2b-04), WIN 2023 (Q3c-07)
 - **Marks Weightage:** High (07 marks)
7. **Explain Cogging and Crawling in induction motors.**
 - **Appeared in:** WIN 2023 (Q3a-03), SUM 2025 (Q3a-03)
 - **Marks Weightage:** Low (03 marks)
8. **Explain the power stages in an induction motor (power flow diagram).**
 - **Appeared in:** WIN 2022 (Q4a-03), WIN 2023 (Q2a-03), SUM 2022 (Q4b-04)
 - **Marks Weightage:** Low to Medium (03 to 04 marks)

Other Important Questions:

- **Necessity of a starter in a 3-phase induction motor. (SUM 2024, Q1a-03)**

- **Explain the working principle of an Induction Generator.** (SUM 2025, Q2a-03)
- **Explain the circle diagram of an induction motor.** (WIN 2023, Q2c-07)
- **Write a short note on Double Cage Induction Motor.** (WIN 2022, Q4b-04), (SUM 2025, Q3b-04)
- **Explain the effect of unbalanced voltages on motor performance.** (Syllabus Topic)
- **Explain speed control methods of a 3-phase induction motor.** (SUM 2024, Q2c-07), (SUM 2025, Q2c-07)

Numerical Problems from this Chapter

- **Slip, Rotor Copper Loss, Efficiency Calculation:** (SUM 2022, Q2c-07), (WIN 2024, Q3c-07), (SUM 2025, Q5c-07) - **Very Common**
- **No-Load Test Parameter Calculation:** (WIN 2024, Q3c-07)
- **Maximum Torque, Speed at Max Torque, Starting Resistor Calculation:** (SUM 2023, Q2c-07)

Chapter 2: Single-Phase Induction Motors

Repeated Questions:

1. **Explain why a single-phase induction motor is not self-starting.**
 - **Appeared in:** SUM 2023 (Q3a-03), WIN 2022 (Q4a-03), SUM 2025 (Q1a-03)
 - **Marks Weightage:** Low (03 marks) but very frequent.
2. **Explain the Double-Revolving Field Theory for a single-phase induction motor.**
 - **Appeared in:** SUM 2023 (Q2b-04), SUM 2022 (Q4a-03), SUM 2024 (Q3c-07), SUM 2025 (Q2b-04)
 - **Marks Weightage:** Medium to High (04 to 07 marks)
3. **Explain the construction and working of a Shaded Pole Induction Motor.**
 - **Appeared in:** SUM 2023 (Q3b-04), WIN 2022 (Q4c-07), SUM 2024 (Q3c-07), WIN 2024 (Q4b-04)
 - **Marks Weightage:** Medium to High (04 to 07 marks)
4. **Explain the working of a Capacitor-Start Induction-Run Motor.**
 - **Appeared in:** WIN 2022 (Q4b-04), SUM 2024 (Q3b-04), WIN 2023 (Q3b-04), SUM 2025 (Q5b-04)
 - **Marks Weightage:** Medium (04 marks)
5. **List and explain the methods of starting a single-phase induction motor.**
 - **Appeared in:** SUM 2024 (Q3c-07), SUM 2022 (Q5c-07)
 - **Marks Weightage:** High (07 marks)

Other Important Questions:

- **Explain the working of a Split-Phase Induction Motor.** (SUM 2024, Q3b-04)
- **Explain the working of a Universal Motor.** (WIN 2023, Q3a-03), (SUM 2025, Q5c-07)
- **Applications of 1- Φ induction motors.** (SUM 2024, Q3a-03)
- **Explain the use of a centrifugal switch.** (WIN 2023, Q3b-04)

Chapter 3: Synchronous Machines (Alternators)

Repeated Questions:

1. **Derive the EMF equation of an alternator.**
 - **Appeared in:** WIN 2022 (Q3a-03), SUM 2022 (Q2c-07), WIN 2024 (Q1a-03), SUM 2025 (Q1b-04)
 - **Marks Weightage:** Medium to High (03 to 07 marks)
2. **Define and explain Pitch Factor and Distribution Factor.**
 - **Appeared in:** SUM 2023 (Q3a-03), WIN 2022 (Q3b-04), SUM 2024 (Q4b-04), SUM 2025 (Q4b-04)
 - **Marks Weightage:** Medium (04 marks)
3. **Explain Armature Reaction in an alternator at different power factors.**
 - **Appeared in:** SUM 2023 (Q1c-07), WIN 2022 (Q2b-04), SUM 2025 (Q4b-04)
 - **Marks Weightage:** High (07 marks)
4. **What is voltage regulation? Explain the Synchronous Impedance Method / ZPF Method.**
 - **Appeared in:** WIN 2022 (Q3c-07), SUM 2022 (Q3a-03), WIN 2023 (Q4c-07), SUM 2025 (Q4c-07), WIN 2024 (Q5a-03)
 - **Marks Weightage:** High (07 marks)
5. **State the conditions for parallel operation of an alternator with an infinite bus bar.**
 - **Appeared in:** SUM 2023 (Q4a-03), WIN 2022 (Q3a-03), SUM 2025 (Q4a-03)
 - **Marks Weightage:** Low (03 marks) but very frequent.
6. **Compare Salient Pole and Cylindrical Rotor synchronous machines.**
 - **Appeared in:** SUM 2023 (Q3a-03), WIN 2022 (Q2a-03), SUM 2025 (Q4a-03), WIN 2024 (Q2c-07)
 - **Marks Weightage:** Low to High (03 to 07 marks)

Other Important Questions:

- **Explain the synchronization process (Two bright, one dark lamp method).** (WIN 2022, Q4c-07), (SUM 2025, Q5c-07), (WIN 2024, Q5c-07)
- **Explain the concept of Synchronous Reactance.** (SUM 2024, Q4b-04)
- **Explain the direct and quadrature axis reactance for salient pole machines.** (SUM 2023, Q4a-03)

Numerical Problems from this Chapter

- **Calculation of Generated EMF/Voltage Regulation:** (SUM 2023, Q4c-07), (SUM 2022, Q5c-07), (WIN 2024, Q5c-07) - **Extremely Common**
- **Calculation of EMF using Pitch and Distribution Factors:** (SUM 2024, Q4c-07), (WIN 2024, Q5c-07)

Chapter 4: Synchronous Motors

Repeated Questions:

1. **Explain the methods of starting a synchronous motor.**
 - **Appeared in:** SUM 2024 (Q5a-03), WIN 2022 (Q5c-07), SUM 2025 (Q2c-07), WIN 2024 (Q4b-04)
 - **Marks Weightage:** Medium to High (03 to 07 marks)
2. **Explain V-Curves and Inverted V-Curves of a synchronous motor.**
 - **Appeared in:** SUM 2022 (Q3b-04), WIN 2022 (Q3c-07), SUM 2023 (Q4b-04), SUM 2025 (Q4c-07)
 - **Marks Weightage:** Medium (04 marks)
3. **What is a Synchronous Condenser? Explain its application.**
 - **Appeared in:** SUM 2023 (Q5a-03), WIN 2022 (Q5a-03), SUM 2024 (Q5a-03), SUM 2025 (Q5a-03)
 - **Marks Weightage:** Low (03 marks) but very frequent.
4. **Explain the effect of changing excitation on a synchronous motor (over-excited/under-excited).**
 - **Appeared in:** WIN 2023 (Q5a-03), WIN 2024 (Q4c-07)
 - **Marks Weightage:** Low (03 marks)
5. **What is Hunting? How is it minimized?**
 - **Appeared in:** SUM 2023 (Q5b-04), WIN 2023 (Q1a-03), WIN 2024 (Q4a-03)
 - **Marks Weightage:** Low to Medium (03 to 04 marks)

Other Important Questions:

- **Explain the construction and principle of operation of an Auto-Synchronous Motor (SynRM).** (SUM 2022, Q4c-07), (SUM 2025, Q5b-04)
- **Why is a synchronous motor not self-starting? How is it made self-starting?** (SUM 2022, Q5b-04)

Chapter 5: Special Machines

Repeated Questions:

1. **Explain the construction, working, and applications of a Permanent Magnet Brushless DC (BLDC) Motor.**
 - **Appeared in:** SUM 2023 (Q5c-07), WIN 2022 (Q5c-07), SUM 2022 (Q4c-07)
 - **Marks Weightage:** High (07 marks)
2. **State the advantages and applications of a Linear Induction Motor.**
 - **Appeared in:** WIN 2022 (Q5b-04), WIN 2023 (Q4a-03), SUM 2025 (Q5a-03)
 - **Marks Weightage:** Medium (04 marks)
3. **Explain the working principle of a Stepper Motor.**
 - **Appeared in:** SUM 2024 (Q5b-04)
 - **Marks Weightage:** Medium (04 marks)

Other Important Questions:

- **Explain the principle of Magnetic Levitation.** (SUM 2022, Q5a-03), (SUM 2024, Q5b-04)
- **Explain the working of a Switched Reluctance Motor (SRM).** (WIN 2023, Q4a-03)
